# BREEDING THE LARGE COPPER, *LYCAENA DISPAR* HAWORTH

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The Large Copper butterfly, *Lycaena dispar* Haworth, exists as three subspecies, *L. dispar dispar,* the extinct British form, *L. dispar batavus* Oberthur, which closely resembles *dispar*, and *L. dispar rutilus* Werneburg. The first two of these are single brooded while the second is double brooded. Although this is a significant difference between the two surviving subspecies, information regarding rearing either of them is rather sparse in the literature and little attention has been focused upon the differences between the two subspecies from this point of view. Recently, however, Brooks and Knight (1982) have given a description of the single brooded race which sketches out the life cycle of this insect. An equally recent account of the double brooded subspecies has not been located to date, although it is of some interest to note that this is the subspecies that Frohawk (1924) describes in detail. The present note records the results of rearing *L. dispar rutilus* during the summer of 1983.

The Large Copper was found in a number of meadow locations between Nancy and Charmes in the department of Meurthe and Moselle in North Eastern France towards the end of June 1983. A pair of female butterflies caught on the 2nd July were put into a flowerpot of about 10" (25cm) diameter together with some leaves and stems of the common Broad-leaved Dock *(Rumex obtusifolius)* and a few wild flowers for food. The pot was covered with netting and placed in sunshine. During the day the pot was moved from sunshine to shade, depending upon conditions, so as to keep the temperature as equable as possible. The butterflies laid freely under these conditions. Ova were deposited on the undersides of the Dock leaves, sometimes singly and sometimes in short strings of from two to five eggs. They resembled grey flattened spheroids to the eye and under a glass revealed the sculpturing typical of Lyceanid ova. When it was discovered that ordinary Dock was a possible food plant wild plants were searched in the localities where the butterflies themselves were to be found. It is of some interest to report that a dozen or so ova were discovered in this way, although only the common Broad-leaved Dock was briefly examined. It therefore seems that in this region of France dependence upon Water Dock *(Rumex hydrolapathum)* is not total.

Ova began to hatch on 6th July and all but a few had hatched by the 8th July. The larvae commenced feeding at once and behaved in the same way as those described by Frohawk, that is they ate

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into the lower surface of the Dock leaving narrow transparant channels bounded above only by the thin upper leaf membrane. Immediately on eclosion the larvae were a yellowish colour, but soon after they started to feed they took on the colour of the Dock leaves themselves, a rather deep green tone.

Initially the larvae all fed rapidly, but after a week it became apparent that there were two groups developing. One of these continued to feed rapidly and began to pupate on 22nd July. Until pupation all these larvae remained green in colour, matching the shade of the Dock leaves, as remarked. The pupae from this forward group began to yield adult butterflies on the 3rd August and all imagines had emerged by 9th August.

These butterflies were rather smaller than the wild examples taken at the start of July but otherwise resembled them closely. No pairings were achieved and the majority of the insects were released near to where the wild parents were captured. For this fast developing group we can summarise by recording that the ova lasted for approximately 6 days, the larval state for approximately 16 days and the pupa for approximately 10 days.

The other part of the batch of larvae did not develop after the second moult. Instead they took on a reddish hue which matched the colour red that appears on Dock leaves during the latter part of the summer and the autumn. These larvae settled onto the undersides of the Dock leaves provided for food and became dormant although it was only the middle of July. They did not appear to lay down a substantial mat of silk to cling to, but as a microscope was not available it is not possible to rule out completely the possiblity that a thin layer was present. As the leaves were replaced, the larvae were brushed off and proceeded to re-establish themselves on other leaves. This continued until all the fast developing larvae had pupated, after which the remaining larvae were left undisturbed. Over the course of the next two months a small percentage of the dormant larvae did recommence feeding and development, to produce butterflies in the early autumn. However the majority remained dormant and are at present (December 1983) still in this state. The fraction of larvae which adopted this strategy amounted to a little less than a half of the total number. The conclusion is that a significant proportion of the larvae from the first brood passed into diapause rather than continued development to the adult stage.

In order to compare the development of the first brood with that of the second generation of butterflies one or two wild females were taken in the same locality as before on the 7th and 9th August. As previously these females laid readily on Dock when confined in a large flowerpot. Ova collected on the 10th August began to hatch on the 15th August and all the ova collected had hatched by the 16th August. In this respect they behaved in a similar way to those of the first generation in that the egg stage lasted for about 6 days. After

hatching the larvae fed rapidly for 10 or 11 days, after which they moulted. They then appeared almost to stop feeding, took on the same reddish hue as the earlier diapausing larvae and took up positions on the undersides of Dock leaves. All of the larvae behaved in an identical manner in this respect, with none showing any tendency to continue development fully. At present these larvae appear to be alive and are outside.

The results recorded here have brought to light two interesting facets of the development of the *rutilus* subspecies as it occurs in North-Eastern France. Firstly, it is certain that the larvae feed readily upon the common Broad-leaved Dock in captivity and that the females will lay on this plant under the same circumstances. The fact that some ova were found on Broad-leaved Dock in the wild also indicates that this food-plant is utilised under natural conditions. The second point to note is that the larvae from the first generation seem to split into two groups, one of which completes its development rapidly, while the other goes into diapause, probably after the second moult. The diapause group can be differentiated form the non-diapause group by colouration.

This aspect of diapause is of interest as it links together the two subspecies and reveals that the *rutilus* form has a flexible pattern of development which may span the whole range from the apparantly strictly univoltine development of *dispar* or *batavus* to a strictly bivoltine form of *rutilus*. Clearly the present results are of a preminimary nature and further breeding experiments will now be needed to clarify matters further. In particular it will be of some importance to determine whether the diapause in the first generation larvae and the second generation larvae is controlled by the same external parameters. In this case it would seem reasonable to test the influence of daylength and temperature here as both of these have been shown to have a considerable effect on the diapause or non-diapause behaviour of many insects including lepidoptera (Danilevskii, 1965; Beck, 1968; Saunders, 1976). It is possible, however, that more than two factors will determine whether a larva enters diapause, and it is equally possible that one population may differ from another in this respect.

## References

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